REMARKS

1. Request for Continued Examination

The applicant respectfully requests continued examination of the above-indicated application as per 37 CFR 1.114.

2. Corrected typographical error in Claim 6

Applicant has amended claim 6 to delete the unnecessary word "and" from the end of the claim. No new matter is entered.

3. Claims 1, 2, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carroll (USP 5,130,571) in view of Tsai (USP 5,825,219)

Applicant has amended independent claims 1 and 11 to include the limitations that the switched capacitor circuit is utilized within an oscillator circuit, wherein the positive side capacitor is further connected to an oscillator node in the oscillator circuit. Additionally, a smallest switch element is switched off last when switching the switched capacitor circuit to an off state. No new matter is entered by these amendments. In particular, support for these amendments is illustrated in Fig.8 and found in paragraph [0037], "The capacitor 80 is connected between the first oscillator node OSC_P and a node A". As shown in Fig.9, the smallest switch element 86 is switched off last. The reason the smallest switch element 86 is switchedoff last is explained in paragraph [0039]: "if the last switch element to be switched off is made sufficiently small, the clock feedthrough effect after the last switch is switched off can be made negligible."

Applicant asserts there is no motivation to combine the teachings of Tsai and Carroll to result in the present invention because different kinds of problems are being solved. Specifically, the switching noise reduced by Tsai is not the same as or similar to the clock feedthrough effect prevented by the present invention. Moreover, applicant asserts that a combination of Tsai and Carroll would not result in the present invention as claimed in currently amended claims 1 and 11 because the combination of Tsai and Carroll does not produce a switched capacitor circuit in an oscillator circuit having the

same structure and features as the present invention. Applicant therefore asserts that currently amended claims 1 and 11 should be found allowable over Carroll in view of Tsai.

Lack of motivation to combine

Concerning the lack of motivation to combine the teachings of Carroll and Tsai due to different types of noise, Tsai did not clearly define the term "noise" in USP 5,825,219, but Tsai mentions that "To achieve fastest possible switching rates between logic low and logic high signals on a computer bus system while minimizing noise, conventional approaches have been provided. Among the conventional approaches is the U.S. Pat. No. 5,483,188 in which related art is recited in greater detail."(col 1, lines 10-14) So it is reasonable to refer to USP 5,483,188 for the definition of the term "noise".

In the background section of USP 5,486,188, Tsai indicates that "the faster the switching rate, the more likely ringing and other noise affects will result. Indeed, a sharp transition from either a high to a low or from a low to a high signal level will result in substantial ringing requiring a considerable settling time." (col 1, lines 21-25) Additionally, as Tsai illustrates in Fig.3, Tsai describes "a substantial period of ringing which results in substantial system noise" (col 2, lines 50-52). In the detailed description, Tsai shows a generated output signal in Fig.8 and states that "the ringing problems illustrated in Fig.3 are avoided" (col 7, line 5). From these references, applicant assumes the term "noise" stated by Tsai in USP 5,825,219 refers to ringing noise caused by a sharp transition from either a high to a low or from a low to a high signal level.

However, as stated in paragraph [0010] of the present invention, "Using the single ended case shown in Fig.2 as an example, when the switch element 32 is turned off, charge carriers are injected to the junction capacitance connected between the first terminal and the second terminal of the switch element 32. The injection produces an undesired voltage step change across the capacitive impedance and appears as a voltage drop at node A. This effect is known as clock feedthrough effect and appears as a feedthrough of the control signal SW from the control terminal of the switch element 32 to the first and second terminals of the switch element 32. When the switch element 32 is turned on, node A is connected to ground so the feedthrough of the control signal SW is of no consequence. However, when the switch element 32 is turned off, the feedthrough of the control signal SW causes a voltage step, in the form a voltage drop to appear at

node A. Because of the dropped voltage at node A, the diode formed by the N+ diffusion of switch element 32 and the P type substrate in the off state will be slightly forward biased. The voltage level at node A will spike low and then recover to ground potential as the forward biased junction diode formed by the switch element 32 in the off state allows current to flow. The voltage drop and recovery at node A changes the load capacitance of the VCO 10 resonator and causes an undesired momentarily drift in the VCO 10 frequency."

Therefore, as taught by the present invention, it is clear that the unwanted effect (note: applicant does not use the term "noise") refers to the voltage drop and its recovery at node A, which is caused by the clock feedthrough effect. Clearly, a ringing noise caused by a sharp transition is not the same or even similar to the clock feedthrough effect. That is, the present invention and Tsai's teachings achieve substantially different results since they resolve different kinds of problems. Applicant therefore asserts there is no motivation for a person skilled in art to derive the present invention from Tsai's disclosure.

Combination does not result in present invention

Applicant asserts that a combination of Tsai and Carroll would not result in the present invention as claimed in currently amended independent claims 1 and 11 because such a combination would not produce a switched capacitor circuit in an oscillator circuit having the same structure and features as the present invention.

Carroll discloses in Fig.4 a sample and hold circuit 20 having two transistors T24, T22, and a capacitor C_S being connected between an output node (V_{OUT}) and ground. As shown in Fig.5, transistor T24 turns off first, and transistor T25 turns off second. Carroll does not teach that the sample and hold circuit 20 shown in Fig.4 could be used in an oscillator circuit and, in fact, the structure of the circuit shown in Fig.4 is not suitable for use within an oscillator circuit because one end of the capacitor C_S is connected to ground. This circuit structure is different than is stated in currently amended claims 1 and 11, wherein the positive side first node is connected to a positive side capacitor and the positive side capacitor is further connected to an oscillator node in the oscillator circuit. As will be recognized by a person skilled in the art, the oscillator node could not be ground or the oscillator circuit would not function as an oscillator. Additionally, Carroll neither teaches that the transistors T24, T22 are of different sizes, nor that the transistors

T24, T22 should be switched off sequentially with the smallest switch element being switched off last as claimed by the present invention in claims 1 and 11.

Referring to Tsai, the circuits and teachings according to Tsai also do not show a switched capacitor circuit having the same structure as taught in currently amended independent claims 1 and 11. Tsai teaches that in a "preferred arrangement, relative sizes of the three output NMOS transistors are so arranged that NMOS transistor 300 is smallest, NMOS transistor 320 is medium and NMOS transistor 340 is largest." (col 3, lines 18-21). However, this is different than the limitation taught in currently amended claims 1 and 11 that states the smallest switch element is switched off last when switching the switched capacitor circuit to an off state. As supported by the paragraph [0039], the present invention is limited to having the smallest switch element being switched off last because "if the last switch element to be switched off is made sufficiently small, the clock feedthrough effect after the last switch is switched off can be made negligible." That is, other embodiments of the present invention are possible wherein the order of the non-last switch elements is not necessarily in decreasing order of size. Tsai does not teach only requiring the smallest switch element to be switched off last.

Applicant therefore asserts a combination of the teachings of Carroll and Tsai would not result in the present invention as claimed in claims 1 and 11. Specifically, neither Carroll nor Tsai teach capacitor switched circuits with the same structure being utilized within an oscillator circuit. Even in the most similar circuit of Fig.4 of Carroll, the capacitor C_S is connected to ground (rather than an oscillator node); therefore, the resulting circuit could not be used within an oscillator circuit. Additionally, neither Carroll nor Tsai teach only ensuring the smallest switch element is switched off last. For these reasons, applicant asserts that a combination of Carroll and Tsai would not result in the present invention without further inventive process. As such, currently amended independent claims 1 and 11 should be found allowable over Carroll in view of Tsai. Claims 2-10 and 12-20 are dependent claims and should be found allowable for at least the same reasons. Reconsideration of claims 1-20 is respectfully requested.

Sincerely yours,

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